Velocity Drive Module

User Manual

Manual Revision 1.5

Drive Software Version 4.3.04/4.3.05

Kinesys Software Version 3.1.4

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Contents

Safety Advice **7**

Introduction **9**

Specifications **10**

Layout **11**

Drive Front View 11
Drive Rear View 13

Drive Display & Menu System **15**

DEFAULT DISPLAY 15
SCREEN SAVER 15
VIEW MENU OPTION 17
RESET MENU OPTION 20
KEYPAD MENU OPTION 20

Power On/Power Off Sequence **21**

Power On 21
Power Off 21

Drive Operation **23**

Running in manual mode from the Drive front panel 23
Running in Auto mode from a remote controller 23
Drive operation under winch fault conditions 24

Pin Connections **25**

MAINS IN 25
MOTOR (0.75kw – 7.5kw 400v Drives) 25
MOTOR (11kw – 22kw 400v Drives) 25
ENCODER 26
BRAKES 26
LIMITS / WINCH CONTROL 27
RS485 28
CTNet 28

Safety Advice

- Carry out a full risk assessment for your particular application
- Only allow competent personnel to operate the system
- Test the emergency stop system on a regular basis
- Never use damaged cables or connectors
- Never operate motors or hoists without having a clear view of the load or reliable communication with an observer
- If an unexpected move presents a potentially hazardous situation, use the emergency stop button to bring all hoists to an immediate stop
- If you are unsure of any aspect of moving loads with the system stop and seek professional advice on the appropriate usage of the system
- Under most fault conditions the Kinesys Velocity drive will to bring the winch to a halt in a controlled manner, at a predefined emergency stop ramp rate. But under the following conditions the drive will stop the winch immediatly, you must take account of this eventuality in the risk assesment of any system that incorporates a Kinesys Velocity drive.
  - Power failure will case an immediate stop
  - Ultimate Limit Stuck will case an immediate stop
  - Drive failure will cause an immediate stop

Introduction

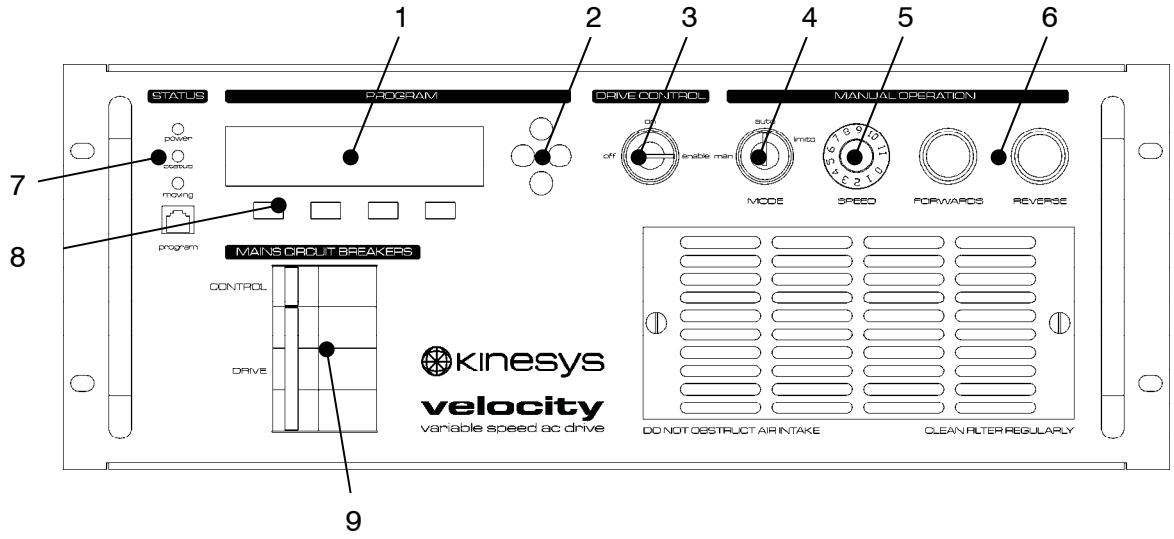
The Velocity drive module is a powerful ac and servo motor drive system that allows a range of motors to be controlled and positioned with absolute precision. Surrounding the advanced inverter technology is a range of user features designed to make using and maintaining the Velocity module very straightforward. Built-in manual running controls and a full diagnostic display help the user to set the system up simply and safely and the rugged steel case and locking metal motor connections ensure a long service life even in harsh physical environments.

Specifications

POWER SUPPLY:	Three phase, neutral and earth supply: phase to phase voltage 380 – 420 v a.c.
ENCLOSURE:	1.6mm steel (front panel 2mm steel) zinc plated and clear passivated finish RAL5011 stove enamelled and silk screened on front panel
ENVIRONMENTAL:	IP40
OPERATING TEMPERATURE:	0 - 55°C (32 - 131 F)
DIMENSIONS:	486 x 500 x 175 (excluding connectors or front panel controls)
WEIGHT:	30 kg

Layout

Drive Front View



1. **INFORMATION AND DIAGNOSTIC DISPLAY**
   displays information about the revolve movement and error messages as well as allowing configuration parameters to be edited

2. **DISPLAY CURSORS**
   these buttons allow the user to navigate the display and edit parameter values

3. **DRIVE CONTROL KEYSWITCH**
   sets the drive into one of three states, drive off, drive disabled and drive enabled. The key is removable in any of the three positions allowing the drive to be securely disabled when left unmonitored if required

4. **MANUAL OPERATION KEYSWITCH**
   sets the drive to automatic mode to be controlled by either a pendant or a computer or to manual mode for local operation

5. **MANUAL SPEED**
   sets the speed of the motor during manual operation

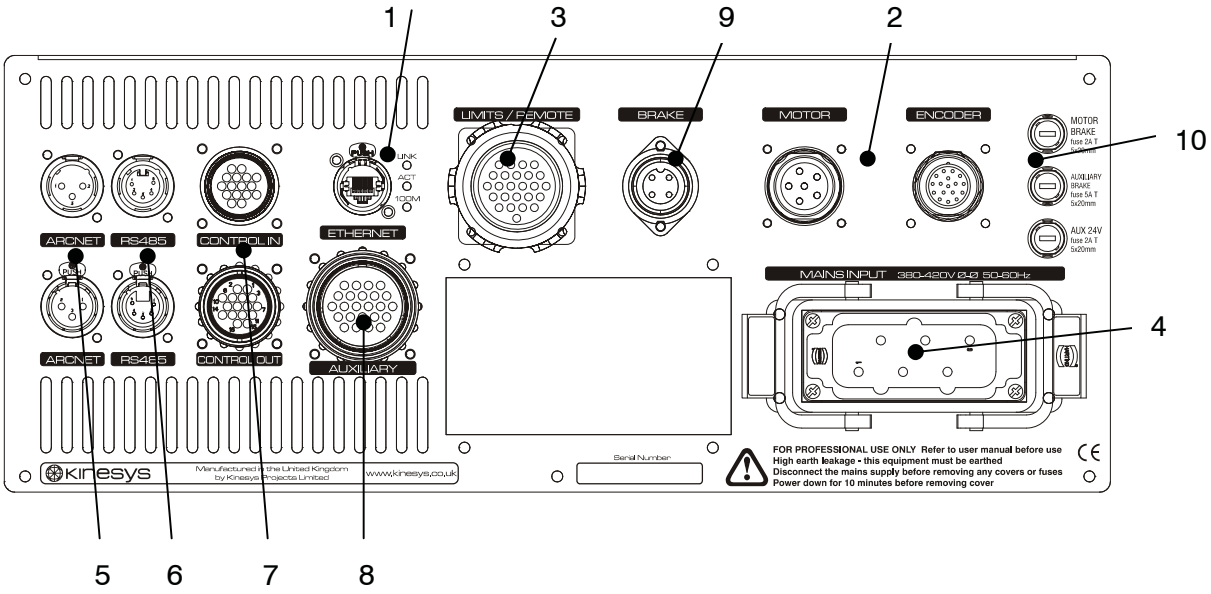
6. **MANUAL DIRECTION**
   press and hold these buttons to initiate manual running

7. **DRIVE STATUS INDICATORS**
   these show whether the drive is powered, whether it is off, disabled or enabled and whether it is moving

8. **DISPLAY SELECTION BUTTONS**
   allows the user to navigate between screens on the information and diagnostic display

9. **CIRCUIT BREAKERS**
   separate circuit breakers for control and drive. Turning off the control breaker will also power down the drive

Drive Rear View



1. **ETHERNET**
   Allows Ethernet connection for computer control and diagnostics.

2. **MOTOR & ENCODER**
   connections to the motor and motor encoder are made here. These connections must be fully tightened to ensure a good electrical connection.

3. **LIMITS & REMOTE CONNECTION**
   connections for over-travel and ultimate limits, overload and slack rope detection and secondary brake.

4. **MAINS IN**
   ensure the supply is turned off at source before inserting or removing this connection

5. **ARCNET**
   permits data network connection directly to the inverter for computer control and diagnostics.

6. **RS485**
   used for external pendants or drive interconnection

7. **DRIVE CONTROL**
   used when connecting multiple drives together or when connecting to an external emergency stop monitor and controller (e.g. Kinesys Array ES)

8. **AUXILLARY**
   Permits the connection of remote equipment including pendants and joysticks etc.

9. **AUXILLARY BRAKE**
   Permits the connection of 190VDC brakes.

10. EXTERNAL FUSES

Drive Display & Menu System

The Velocity drive module incorporates an information and diagnostic display that allows the user to view and set parameters within the drive. These configure the way that the drive calculates its motion profiles and limits the top speed and ramp rate the load will travel at.

The information is accessed by viewing the display and by using the eight buttons underneath and to the right of it. The buttons to the right act as cursor buttons allowing the user to move up and down lists and to edit parameter values. The buttons underneath the display allow the user to move between screens and to allow different data to be displayed.

DEFAULT DISPLAY

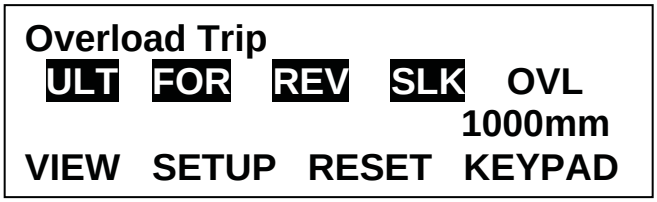
The default display is split up into three main regions.

The top line of the display is the status window this shows the current alarm state, if multiple alarms are active each one will be displayed in turn for a second. A complete list of the displayed alarms is shown later in this manual. If the drive has no active alarms the message “System OK” will be displayed.

The middle part of the display shows the current position of the controlled winch or motor. This is displayed in mm and is normally shown in a large font .

The bottom part of the display indicates the functions of the four buttons below the display. The functions of these four buttons will change depending on what screen is currently being displayed.

The default display format will change slightly if any of the external limits are activated.



The status window will change to two lines with the bottom line showing the state of the five limit switch inputs. The display above shows the Ultimate, Forward, Reverse and Slack limits all intact limit and the Overload limit tripped. Intact limits are shown in reverse video.

SCREEN SAVER

After a few seconds of inactivity the display will revert so a scrolling screen saver display. This display will include the message “** ALARMS ACTIVE **” if any error or trip conditions exist.

Pressing any key on the keypad will bring up the default screen where status messages will be shown on the

ALARMS
The following table lists all the alarms that could be displayed in the status window.

Alarm Displayed	Alarm Description
Reverse Limit Trip	The Reverse limit switch has been hit
Forward Limit Trip	The Forward limit switch has been hit
Overload Trip	The Overload limit switch has been hit
Slack/Underload Trip	The Slack rope limit switch has been hit
Ultimate Limit Trip	The Ultimate limit switch has been hit
Limit Override	The Mode key switch on the front panel is being held in the spring loaded “Limits” position which bypasses all external limits and allows, a motor to be driven off a limit. Note the drive is still able to sense the state of the external limits.
Brake Resistor Trip	
Contactor Jammed	The main input contactor is jammed is on when the drive is expecting it to be off
Drive Disabled	The Drive is in a disabled state. For the drive to be enabled, the external drive enable signal on the Drive Control connector, on the back panel, needs to be intact. Also the Drive Control key switch on the front panel needs to be in the Enabled position
Emergency Stop Active	The Emergency Stop signal on the Drive Control connector, on the back panel, is missing.
Fast Stop Active	The Enable signal on the Drive Control connector has just been lost and the drive is ramping to a stop at the emergency ramp rate.
Wire/Groove Jump	The Wire/Grove Jump limit switch on the winch has tripped.
Belt Break	The Belt brake detect switch on the winch has been activated.
Aux Power Fuse Fail	The Auxiliary 24v power fuse has blown, see the fuse holder on the back panel.
Main Brake Fuse/PSU Fail	The Main Brake Fuse has failed, see the fuse holder on the back panel.
Sec Brake Fuse Fail	The Secondary Brake Fuse has failed, see the fuse holder on the back panel.
Main Brake Disconnect	Indicates that the main brake is not drawing current when energised
Sec Brake Disconnect	Indicates that the secondary brake is not drawing current when energised
Main Brake Fail	Indicates that the main brake has not released
Sec Brake Fail	Indicates that the secondary brake has not released

I2C Comms Failure	Internal Fault please contact the supplier
Drive Comms Fail	Internal Fault please contact the supplier
Drive Off	The Inverter Drive within the box is powered off this could be because:- • The Drive Control Switch is in the Off position. • The Drive MCB is in the Off position. • The Emergency stop signal on the Drive Connector is missing.
Drive Trip	The Drive has tripped. The drive trip code will be displayed along with this message.
Local Manual Mode	The Mode Key switch on the front panel is in the Manual position. This will allow the drive to be controlled by the forwards, reverse and speed controls on the front panel
Manual Up Active	The Manual Up button on the front panel is being pressed.
Manual Down Active	The Manual Down button on the front panel is being pressed.

VIEW MENU OPTION

The View menu option allows the default display of the drive to be switched to show something other than the current position. The most important of those display options are shown below.

View Option	**Description**
Current Position (mm)	Will show the current position in mm
Motor Current (A)	Will show the current motor current in A
Drive Load (%)	Will show the current drive load as a % of full current load. Note the drive is capable of driving up to 175% of full load for a few seconds
Motor RPM (rpm)	Show the current motor speed in rpm

To select a display option the view key is pressed and the up and down arrow keys are used to highlight the desired display option. This is then chosen by pressing the 'select' key.

SETUP MENU OPTION

The Setup menu option allows various drive parameters to be displayed and edited. A list of the menu options is shown below.

View Option	Description
Unit Address	This will allow the unit address to be changed. For Ethernet access this drives IP address would be 192.168.18.X where X is the Unit address. X will also be the drives CT net address.
Drive Rating	This read only Parameter shows the maximum heavy duty current rating of the drive. The values shown below show the correlation between current rating and the Drive Power rating at 400V. 9.50A = 4kw 13.00A = 5.5Kw 16.50A = 7.5Kw 25.00A = 11kw
Software Version	This is a read only display of the drives current software version.
KinPos Version	This is a read only display of the drives current positioner software version.
Upper Limit (mm)	This parameter allows the upper soft limit to be adjusted. This soft limit is only active when the drive is controlled from a computer. The manual controls on the front panel ignore the soft limits.
Upper Limit (mm)	This parameter allows the loer soft limit to be adjusted. This soft limit is only active when the drive is controlled from a computer. The manual controls on the front panel ignore the soft limits.
Set Position (mm)	Changing this value will change the position the drive currently thinks its at. It allows the drive position to be re-referenced.
Gearbox Ratio (x100)	To allow the drive to correctly display the distance in mm, the gearbox ratio of the winch should be entered here. Note to this gearbox ratio is multiplied by 100. A gearbox ratio of 25.7 should be entered as a value of 2570.

Brake Type	This value determines how the primary and secondary brakes work together. The following values are valid. 0 = The primary brake is released for the duration of a move. The Secondary Brake follows the Primary Brake. This is the normal mode of operation. 1 = The primary brake is released for the duration of a move. The Secondary Brake is released whenever the drive is enabled. This mode is primarily used when the secondary brake is a very large slow acting device. 2 = The primary brake is released whenever the drive is active and holding the load. The Secondary Brake follows the Primary Brake. This mode is primarily used when controlling servo motors that are energised all the time. Any other value in this parameter will act like a value of 0.
Drum Circ (mm)	To allow the drive to correctly display the distance in mm, the circumference in mm of the winch drum should be entered here.
Max Speed (mm/s)	This value is automatically calculated from the Gearbox ratio and Drum Circumference, but can be altered here if required.
Estop Ramp (mm/s/s)	This is the ramp rate that will be used if a Fast stop is triggered externally by removing the enable line. This ramp rate should be set as high as possible for the installation to allow the winch to stop in the shortest possible time.
Jog Ramp (mm/s/s)	This is the ramp rate that will be used when the drive is controlled by the manual controls on the front panel.
Move Delay (x1ms)	The drive is capable of delaying the start of a move if the brakes are applied, to allow them time to release. A maximum value of 2000 = 2s is allowed for this value.
DigLock Mode (0-4)	This parameter specifies if the drive is digitally locked to other drives. Digital locking requires extra hardware and this parameter should be left at its default value of 1.
Invert Direction (0-1)	This parameter allows the drive to select which direction of rotation of the drum relates to a forwards movement. This value should be set as required by the installation.

RESET MENU OPTION

This key will case the Inverter Drive to be reset which will clear any drive trips shown in the status window.

KEYPAD MENU OPTION

Pressing the menu key below the keypad option, switches the drive into a debug mode that allows debugging equipment to be plugged into the program port on the front of the drive. The drive will detect if this equipment has been removed after a couple of minutes and switch itself back to normal operating mode. This state is indicated by the Keypad text flashing.

Power On/Power Off Sequence

Power On

1. Make sure all relevant motor, power and control connections are made correctly
2. Turn on the 32A three phase supply
3. Turn on both the circuit breakers on the front of the drive. The display on the front of the drive should illuminate
4. When you are ready to move turn the 'drive control' key switch on the front of the drive to 'enable'

Power Off

The power down procedure is performed by following the power up procedure in reverse.

Drive Operation

Running in manual mode from the Drive front panel

The Velocity drive module has manual controls fitted to the front panel. This allows motors to be controlled directly from the drive. A clear view of the moving load must be available for safe operation.

To move the load from the drive turn the Drive Control key switch to the 'enable' position and the mode key-switch to the 'manual' position. The 'forwards' and 'reverse' buttons will illuminate.

The manual controls on the front of the drive use the jog ramp set in the drive under the setup menu. This should be checked to ensure it is the desired value. You should ensure that the speed control on the drive is set to minimum speed (fully anti-clockwise) before commencing movement.

To start the winch moving simply press and hold either the 'forwards' or 'reverse' buttons depending on the desired direction. Then slowly advance the speed control until the load is moving at the desired speed.

The manual controls on the front panel allow the winch to be driven between its upper and lower limits, they will ignore any software limits set in the drive.

If the winch fails to move or stops moving, refer to the status window on the drive display act check the displayed message against the list shown in the menu system section of this manual.

Running in Auto mode from a remote controller

The Velocity drive module can be controlled from an external controller via interface connections on the back panel. The primary method of connection is via Ethernet and allows complex systems to be controlled using the Kinesys "Vector" and "K2" control software packages. Please contact Kinesys for more details on these products.

To switch the drive into Auto mode, move the Drive Control key switch to the 'enable' position and the mode key-switch to the 'auto' position. In this mode local control from the drive is inhibited.

Drive operation under winch fault conditions

Various fault conditions can occur at the winch and the drive will react in certain ways depending upon the severity of the fault. Various conditions are listed below along with the appropriate drive response.

Winch Fault	**Drive response**
Ultimate Limit struck	The drive will stop abruptly with no ramp down and the brakes will be applied immediately
Belt brake limit active	The drive will stop abruptly with no ramp down and the brakes will be applied immediately
Forwards limit struck	The drive will ramp to a stop at the emergency ramp rate. The brakes will then be applied
Reverse limit struck	The drive will ramp to a stop at the emergency ramp rate. The brakes will then be applied
Slack Rope limit active	The drive will ramp to a stop at the emergency ramp rate. The brakes will then be applied
Overload limit active	The drive will ramp to a stop at the emergency ramp rate. The brakes will then be applied

Pin Connections

MAINS IN

Harting HsB / ILME CP / Contact HBS - male on panel with 2 locking levers
Panel Connector:
Harting HsB6 male with 2 levers 09 31 006 2601 / 09 30 016 0301
Mating Connector:
Harting HsB6 female with 4 pegs 09 31 006 2701 / 19 30 016 1522

PIN	FUNCTION
1	phase L1
2	phase L2
3	phase L3
4	neutral
5	no connection
6	earth
shell	earth

MOTOR (0.75kw – 7.5kw 400v Drives)

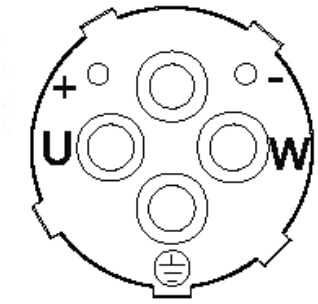
Intercontec Series B 5+E / Contact LS1 5+E –
female on panel with screw locking ring
Panel Connector: Intercontec BSTA 085 NN 00 59 0035 000
Mating Connector: Intercontec CKUA 267 …

PIN	FUNCTION
1	phase U
2	phase V
3 / E	earth
4	phase W
5	Brake + 24V DC
6	Brake 0V

MOTOR (11kw – 22kw 400v Drives)

Intercontec Series C 6-pole - female on panel with screw locking ring
Panel Connector: Intercontec CSTA 263 …
Mating Connector: Intercontec CKUA 267 …

PIN	FUNCTION
U	phase U
V	phase V
W	phase W
E	earth
+	Brake + 24V DC
-	Brake 0V



view on female connector mating face

ENCODER

Intercontec Series A 17-pin / Contact R2.5 17-pin –
female on panel with screw locking ring
Panel Connector: Intercontec ASTA 035 FR 01 61 0035 000
Mating Connector: Intercontec AKUA 034 MR 04 61 0035 000

pin	function (Servo)	function (SinCos)	function (HiperFace)	function (EnDat)	function (SSI)	
1	thermistor	thermistor	thermistor	thermistor	thermistor	
2	thermistor 0V	thermistor 0V	thermistor 0V	thermistor 0V	thermistor 0V	
3	thermistor screen	thermistor screen	thermistor screen	thermistor screen	thermistor screen	
4	U	simulated encoder out A	simulated encoder out A	simulated encoder out A	simulated encoder out A	
5	/U	simulated encoder out /A	simulated encoder out /A	simulated encoder out /A	simulated encoder out /A	
6	V	simulated encoder out B	simulated encoder out B	simulated encoder out B	simulated encoder out B	
7	/V	simulated encoder out /B	simulated encoder out /B	simulated encoder out /B	simulated encoder out /B	
8	W			clock	clock	
9	/W			/clock	/clock	
10	A	Cos	Cos	Cos	Cos	
11	Z		data	data	data	
12	/Z		/data	/data	/data	
13	/A	Cosref	Cosref	Cosref	Cosref	
14	B	Sin	Sin	Sin	Sin	
15	/B	Sinref	Sinref	Sinref	Sinref	
16	+V	+V	+V	+V	+V	
17	0V	0V	0V	0V	0V	

BRAKES

Amphenol C16-3 8+E - female on panel with locking threads
female on panel with locking threads
Panel Connector: Amphenol C016 10G008 0001
Mating Connector: Amphenol C016 10I008 0021

PIN	FUNCTION	NOTES
1	Phase L3 un-switched	Controlled by drive power contactor
2	Neutral un-switched	Controlled by drive power contactor
3	190V DC + switched	Controlled by secondary brake circuit
4	190V DC - switched	Controlled by secondary brake circuit
5	24V DC + switched	Controlled by secondary brake circuit
6	24V DC - switched	Controlled by secondary brake circuit
7	No connection	
8	No connection	
E	earth	

LIMITS / WINCH CONTROL

Tourline TL25 - female on panel with screw locking ring
Panel connector: Ten-47 Tourline TL25PF26
Mating Connector: Ten-47 Tourline TL25LM01

pin	function	notes
A	E-stop 1A	emergency stop circuit 1 - link to B if not used
B	E-stop 1B	
C	E-stop 2A	emergency stop circuit 2 - link to D if not used
D	E-stop 2B	
E	E-stop 3A	emergency stop trace circuit - link to F if not used
F	E-stop 3B	
G	brake +24V DC	secondary brake connection
H	brake 0V DC	secondary brake connection
J	brake +24V DC	secondary brake connection
K	brake 0V DC	secondary brake connection
L	24V DC	limits / sensor power supply
M	0V	limits / sensor power supply
N	home sensor	datum sensor - connect to 24V
P	ultimate limits	connect to 24V - link to 24V if not used
Q	forwards limit	connect to 24V - link to 24V if not used
R	reverse limit	connect to 24V - link to 24V if not used
S	slack rope	connect to 24V - link to 24V if not used
T	overload	connect to 24V - link to 24V if not used
U	sensor 1	auxiliary sensor - connect to 24V
V	sensor 2	auxiliary sensor - connect to 24V
W	21	reserved
X	limits override	connect to 24V to override limit switches
Y	remote data +	remote control HMI connection
Z	remote data -	remote control HMI connection
-	data ground	remote control HMI connection

RS485

XLR5 - link in and out
Panel Connector: Neutrik NC5MDL1 / NC5FDL1
Mating Connector: Neutrik NC5FX / NC5MX

pin	function
1	Data ground
2	Rx-
3	Rx+
4	Tx-
5	Tx+

CTNet

XLR3 - link in and out
Panel Connector: Neutrik NC3MDL1 / NC3FDL1
Mating Connector: Neutrik NC3FX / NC3MX

pin	function
1	Data ground
2	Data A
3	Data B

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